

Appendix 5-A
HST Operating and Maintenance Cost
for Use in EIR/EIS Project-Level
Analyses

MEMORANDUM

HST Operating and Maintenance Cost for Use in EIR/EIS Project-Level Analyses

PREPARED FOR: Central Valley Regional Teams

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The memo documents the assumptions used to estimate full system high-speed train (HST) operations and maintenance (O&M) costs. The estimates take into account passenger ridership in the year 2035, levels of system activity, materials requirements, and basic staffing derived from overseas experience with HST, adjusted for California-specific requirements, and unit costs applicable to California conditions.

The costs are estimated from three HST system variables and three general terms:

1. Trainset miles operated; taken from the schematic operations pattern in Appendix 5-A, Operations and Service Plan, for a high-ridership scenario with HST fares at 50% of airfare levels, and reduced to 2/3 of that level for the lower-ridership scenario with HST fares at 83% of airfare levels.
2. Route miles for the full system.
3. Number of stations in the full system.
4. Insurance.
5. Headquarters administration and support.
6. Contingency.

An average wage per employee was assumed of \$35 per hour (2010 dollars), resulting in an average salary of approximately \$73,000, well above the average salary of the highest California metro area, and similar to the wages of an average employee of the U.S. freight railroads. Based on U.S. experience, an additional 34% was assumed for total cost to the HST operator to cover Social Security, Medicare, and other government payments, health and savings plans, paid vacation, holidays and sick leave resulting in an all-in hourly rate of \$46.35, equivalent to \$96,400 per year. In addition, based on railroad experience in the U.S. and overseas, a contingency was added to all labor costs of 15% for drivers and on-board train crew, and of 10% for all other labor to account for overtime and inefficiencies associated with scheduling.

The cost per trainset mile of \$20.60 (2010\$) is made up of three elements:

1. Crew and operations at \$2.47 per trainset mile based on U.S. work practices and labor cost and the California operating pattern. Each trainset is staffed by a crew of five. The number of hours worked includes time spent operating and serving on the train, reporting in, daily job briefings, pre-departure testing the equipment, release time at the end of the day, training refreshers, time between trains and similar non-revenue service time.
2. Maintenance of trainsets at \$8.86 per trainset mile, based on French TGV experience, U.S. labor cost, a 5% bulk-up for higher speeds and including mid-life overhaul. This cost was benchmarked against other HST operations, and turned out to be the highest of all reported costs, with Japanese HST cost reported at \$7.42 a mile and other European experience without mid-life overhaul at \$4.29.

3. Energy to power the train and facilities at \$9.27 per trainset mile, drawn from power load design studies for the HST, and average per kWh cost of 15.65 cents, based on average of BART and LA Metro cost plus 3.09 cents for "green power."

The cost per route mile to maintain the infrastructure is estimated at \$206,000, based on the highest reported costs in Europe.

The per station cost of \$4.22 million a year is built up from staffing estimates using U.S. labor costs.

Insurance costs were set at \$25 million a year, higher than the most expensive U.S. rail operator (Metrolink 2010, with a much higher risk profile because of at-grade crossings and absence of positive train controls).

Headquarters administration and support were set at 10% of the above costs.

Ten percent (10%) contingency was added on top of all the costs above.

Table 1 shows the resulting costs for the two scenarios of ridership.

Table 1
Full System Operating and Maintenance Cost by Category, 2035
(2010 \$\$ in millions)

O&M Activity	HST Fares at 50% of Air	HST Fares at 83% of Air
Operations & Maintenance of Equipment	\$1,973	\$1,316
Maintenance of Infrastructure	\$165	\$165
Stations	\$101	\$101
Insurance	\$25	\$25
Administration (10% of above)	\$226	\$161
Contingency (10% of above)	\$249	\$177
Total	\$2,739	\$1,944

For planning, engineering and design purposes, the 800-mile HST system has been divided into nine geographic sections. None of the sections would operate independently; rather, they would operate as part of an integrated system. However, to assist the regional teams in their evaluation of environmental impacts associated with the future construction and operation of individual HST projects, O&M costs have been apportioned by section.

O&M costs in 2010\$ are apportioned to the Fresno to Bakersfield Section in Table 2 based on the levels of activity associated with the Section as a proportion of full system costs. Operations and maintenance of equipment costs are apportioned on the basis of trainset miles operated, assuming either the system's sole heavy maintenance facility (HMF) is located within the Fresno to Bakersfield Section, or not. Maintenance of infrastructure cost is apportioned on the basis of a mid-range mileage of the alternatives (120 route miles) and the 800 total route miles. Stations cost is apportioned based on 3 of the 24 stations being in the Fresno to Bakersfield Section. Insurance cost is apportioned on the basis of the sum of the first three cost categories of the Fresno to Bakersfield Section to that of the full System. Administration and contingency are calculated as in the full system on the Fresno to Bakersfield Section cost categories.

Table 2
 Annual 2035 O&M Costs Apportioned to the Fresno to Bakersfield Section
 (2010 \$Millions)

Annual O&M Cost	HST Fares at 50% of Air		HST Fares at 83% of Air	
	Without HMF	With HMF	Without HMF	With HMF
Operations & Maintenance of Equipment	\$236	\$628	\$158	\$419
Maintenance of Infrastructure	\$25	\$25	\$25	\$25
Stations	\$13	\$13	\$13	\$13
Insurance	\$3	\$3	\$3	\$3
Administration (10% of above)	\$28	\$67	\$20	\$46
Contingency (10% of above)	\$30	\$74	\$22	\$51
Total	\$335	\$809	\$240	\$556

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